World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:10, No:05, 2016

Corrosion of Fe-(9~37) Wt%Cr Alloys at 700-800 °C in N_2-H_2O-H_2S Mixed Gas

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Abstract : Fe-(9, 19, 28, 37) wt%Cr alloys were corroded at 700 and 800 °C for 70 h under 1 atm of N_2, 1 atm of N_2/3.2%H_2O-mixed gas, and 1 atm of N_2/3.1%H_2O/2.42%H_2S-mixed gas. The corrosion rate of Fe-9Cr alloy increased with the addition of H_2O and increased further with the addition of H_2S in N_2/H_2O gas. Fe-9Cr alloy was non-protective in all gas types. In contrast, Fe-(19, 28, 37) wt%Cr alloys were protective in N_2 and N_2/H_2O-mixed gas because of the formation of the Cr_2O_3 layer. They were, however, non-protective in N_2/H_2O/H_2S-mixed gas because sulfidation dominated, forming the outer FeS layer and the inner Cr_2S_3 layer containing some $FeCr_2S_4$.

Keywords : Fe-(9, 19, 28, 37) wt%Cr alloys, corrosion, sulfidation, FeS
Conference Title : ICCMME 2016 : International Conference on Composite Materials and Materials Engineering
Conference Location : Tokyo, Japan
Conference Dates : May 26-27, 2016